# Title: An International Effort to Update Braille for a Dynamic and Personalized Future

## Submission Type

Paper

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## Key Objectives:

* To discuss the complicated process of building an international braille file standard, how different organizations around the world have different interests and needs in a new file standard, and how braille differs from one braille region to the next.
* To explore the differences between dynamic and static braille, such as, the different formatting needs of dynamic braille compared to static braille, as well as the advantages of dynamic braille over static braille and, likewise, the advantages of static over dynamic.
* To discuss how braille will change with this new file type, explore new levels of interactive braille materials, highlight the advantages of enhanced navigation and dynamic formatting, understand the limitations of this new file standard, and question what else we need to do to encourage and promote braille literacy.

The Braille Ready Format (BRF) file has long served as a fundamental component of electronic braille across numerous regions. Its small file size makes it easy to share using either email or a thumb drive, and it is easy to open, which is great because a lot of braille technology has limited capabilities. Consistency is the most important aspect of the file type because it means that the reader is getting what the creator of the file intended and there will not be any changes. Finally, the fact that the file type works with both dynamic and static sources is a benefit because it allows a single file type to serve both refreshable braille displays and embossers in an equal way.

One of the biggest limitations of the BRF is that the formatting is hardcoded. This means that if you want the best reading experience, you need to have the braille reproduced on a device that has the same layout as what was intended when the file was created. For instance, if you have a braille file that is made for 40 cells per line and try to read it on a device that only supports 20 cells per line, the material is going to be more difficult to read because of awkward line breaks that are caused by this incongruity between the file and the hardware.

Also, the BRF lacks any markup or links for navigation. Without markup, software that is interpreting the file will have a more difficult time making certain assumptions such as, what is or is not a page number. Since page numbers look just like any other number to the software, a user that wants to skip to a particular page will need to rely on something like “Find,” which means "finding" every instance of the number they are looking for throughout the book until they finally get to the one that they are wanting. No markup also means no headings, no lists, no real tables. A table in a BRF is just a few columns of braille without enhanced navigation or text-to-speech software to read the material in the order intended.

A BRF also uses ASCII. ASCII stands for American Standard Code for Information Interchange. The BRF file will use these ASCII characters to represent braille characters and then, when a visual interpretation is required, a braille font will be applied. There are several flaws inherent in this scheme. For example, not every braille region uses ASCII. Some have their own system for using print characters to represent braille characters, which can lead to translation issues when the system they are using is not known or, at least, not considered. Since this system relies on a braille font, the person receiving the file must have the same braille font to see the characters as braille. If they do not have the same font, they will only see the ASCII characters and only a minority of people that can read braille are familiar with which ASCII character corresponds to which braille character. This reliance on ASCII characters also affects screen reader users as the screen reader will attempt to read these characters the same way it would other print material which leads to some symbols being skipped and many words with contractions being pronounced in a way that is unintelligible to most.

Finally, the BRF lacks any accommodation for tactile graphics. The current system is to leave blank space in the BRF for where the tactile graphic will go and then to have the page of braille with the tactile graphic in a separate file, usually a PDF, JPG, or PNG file. This complicates both the production and consumption of braille files as the two disparate file types must be collated either by the printing house or the reader themselves.

Many of the compromises required by the BRF have been accepted because there wasn’t a better option. Other file types exist with various levels of support along with their own benefits and drawbacks, such as the Portable Embosser Format. Another option would be not even using formatted braille at all and using a print file format like EPUB instead, relying on either audio or automatic translation. However, advances in technology mean that an improved braille file type is possible to create, support with current technology, and will be a benefit as newer technology is released like multiline braille displays.

Multiline braille presents an interesting problem versus single line braille when it comes to braille files that lack markup since it finally allows for formatting to be shown. Malformed formatting caused by an incongruity between the number of cells required by the file and the hardware that is displaying it, is unacceptable. This means that as more different kinds of multiline devices are available in the market, the more braille files would need to be made specifically for each kind of device. Without a new braille file type that is page size agnostic, the field could get into a situation where braille files are made specifically for 40-cell paper, a 32-cell device, a 20-cell device, and so on. Braille libraries that are already fragmented by the use of contractions will then become further divided by which device they are intended to be read on.

The other major factor here is that as computer processors and RAM have become less expensive, they have less and less impact on the final cost of the device. Thanks to these improvements, many newer braille displays are already supporting more complicated file types like EPUB and PDF, so there is less incentive to settle for a simpler and less robust braille file type that is lacking in so many modern conveniences.

It is with all these needs in mind that an effort began in 2022 to create a new braille file type that is tentatively being called eBraille. Initiated by the American Printing House for the Blind (APH), they knew that they could not do it alone. A file type specific to APH would not gain the traction needed to be truly useful, and we could end up in a situation where each organization had their own bespoke file type which would be a difficult situation to support, both with a limited pool of transcribers and with ever more complicated software needs. For that reason, APH partnered with the DAISY Consortium undertaking an international effort to create a file type that could benefit the entire field. That effort has grown over its history and now includes active involvement from both individuals and organizations representing braille users, transcribers, teachers, braille libraries, blindness organizations, braille code and formatting standards organizations, as well as companies developing both braille hardware and software. The hope is that by involving so many diverse viewpoints and needs, we might develop a file type that can meet the needs of the braille field throughout the world for a long time.

## Different Needs for Different Organizations

The primary concern for the working group focused on the eBraille file type is braille users and the features and benefits will most likely support their needs. Through discussion, it was determined that markup for enhanced navigation and improved formatting, internal and external links to further aid navigation, and the inclusion of tactile graphics to support dynamic braille were the primary concerns. Additionally, it was determined that using Unicode braille instead of ASCII would be a benefit for sharing braille files across international boundaries.

An additional concern was how this file type would be accessed. We would need software that could open the file and hardware that was capable of either embossing it or displaying it dynamically. It is for these reasons that the effort had the primary goal of attempting to align the new file type with mainstream options. Aligning with a mainstream format would make the file type easier to support and would align the file type with the strategic direction of the accessibility movement.

An early favorite packaging format for eBraille has been EPUB. EPUB readers already exist and EPUB is already a popular distribution method for accessible materials. EPUB also already has support for markup, links, and images, so it remains a favorite of some members of the eBraille Working Group, though a final packaging format has not been determined at the time of this writing.

Braille libraries have different needs as well. Some of the concerns surrounding braille libraries concern metadata. Metadata is data about data, and it can help an organization keep track of hundreds or even thousands of braille files. It also makes it easier for users to sort through that material and find what they are looking for. One of the issues with metadata is that what one organization cares about, another may not, so you must balance the need to standardize what metadata is required, while also not forcing an organization to account for an aspect that does not matter to them. It is also important to be mindful of language requirements. While one concern might be ensuring that everyone uses the same vocabulary for their metadata, you risk forcing a particular understanding, such as using "grade level," a term that is meaningful to the United States but not other parts of the world. Finally, if you make a requirement too strenuous, file creators may instead fill in bad data and bad data can be worse than no data at all since it just becomes noise that must be sorted through.

Transcribers have been an important part of the process as well. If the extra work to create this new file type is too great, it could cause people to retire early, leave the field, or otherwise not engage with it. While no compromises on quality have had to be made to keep the file easy to produce, the level of work involved in any new aspect of the file's creation has been considered at each step. It has been helpful that many transcribers are already applying markup to their files when creating braille, even if it is currently being thrown out during the saving process. The only new aspects of the task of braille file creation are adding metadata, links, and tactile graphics. These additions will require some extra work, but the workflow of individual transcribers will not be dramatically altered.

A major consideration has been braille code and formatting standards organizations. This is primarily because one of the main goals of the standard is to replicate the same level of formatting and quality that braille users expect with the current file type. Braille codes and formatting rules are different all over the world, so it is important that each standard is considered. While specific considerations must be made for each individual braille region, the overall guidance must be agnostic and generally applicable across braille regions.

## Different Needs for Different Braille Regions

Generally, braille formatting rules around the world do not agree on much. According to discussions in the working group meetings, the only formatting aspects that are common to braille throughout the world are that paragraphs start in cell 3 and then run to the left margin, and that braille always goes left to right. The fact that braille always goes left to right is only because of hardware limitations. Braillers and embossers cannot easily accommodate other directions and the quantity of these devices that are made is so small that it was not feasible to have them go right to left. That need probably could be met now, but with the formatting rules already in use, it may not make sense to change at this point.

Even though the particulars of formatting rules are so different around the world, the pieces that make up braille formatting are relatively common. All items need to be indented. They may need to be indented different amounts and subsequent lines may need to be similarly or differently indented, but the need for indentation is a commonality. Some items need to be centered, so you need to think of that, too. Blank lines are a common way to convey the separation of items, so you must have rules that allow for blank lines as well as allowing for blank lines to be suppressed under specific circumstances. Sometimes you need a specific braille character, or series of different ones, to take up all remaining space on a line, or to take up the entire available line. Page numbers typically appear in the corner of the page. Even though the corner varies around the world, the principle is that you need to account for braille to potentially appear in any corner.

Luckily, all these formatting needs are possible. There may be some places where CSS needs to be extended to allow for particular situations, but it is not an insolvable problem. The main idea is that even though braille formatting rules are so different around the world, there is a lot of commonality in the principles of braille formatting making it is easy enough to account for these differences. So far there is no braille formatting requirement that cannot be accounted for.

## Dynamic versus Static Braille

Many of the rules of braille are due to the static page. Running heads are there to ensure that the pages of another book do not accidentally find their way into the volume that you are reading. Many times, there are rules about not starting particular kinds of text on the last line of the page, or to ensure that material is not interrupted by a page break. Such rules make a lot of sense from the perspective of an embossed braille page, but not from a dynamic single-line or multi-line device. Nearly all but the shortest material will be interrupted with a single-line device. While it may be possible to display an entire item uninterrupted with a multi-line device, it's also possible for the user to make their own determination about when an item needs to be adjusted so that it is entirely in view. When reading casually, a reader may decide that such formatting concerns are unimportant, while in a high-stake testing environment, those same concerns may be elevated in importance.

Additionally, braille page numbers are almost meaningless in a dynamic braille environment. On a single-line display, they end up taking up a lot of space and have almost no relevance to the reading experience of the user. On a multi-line device, they will vary so much from device to device that they cannot be hardcoded.

Print page numbers will remain an important tool for navigation and citations, but whether they need to be displayed is something that the user can decide in a dynamic environment. When dealing with embossed braille, you absolutely need them otherwise your stacks of volumes will sit dangerously on the edge of chaos, as just the slightest breeze might clutter them into a nearly irrevocable state.

## A New Future for Braille and Braille Users

Ultimately, I think one of the main things that will change for braille users around the world is an increase in choice. Currently, a lot of decisions about braille are decided for the braille user and those choices are then hardcoded into the file types that we rely on. eBraille allows the user to decide whether print page numbers are displayed and how, what material they are currently viewing, which formatting rules are necessary, and which are situational. It will take time for the new files type's specification to be finalized and for the software to be developed, but we're moving toward a future where the power will rest in the fingers of braille users.